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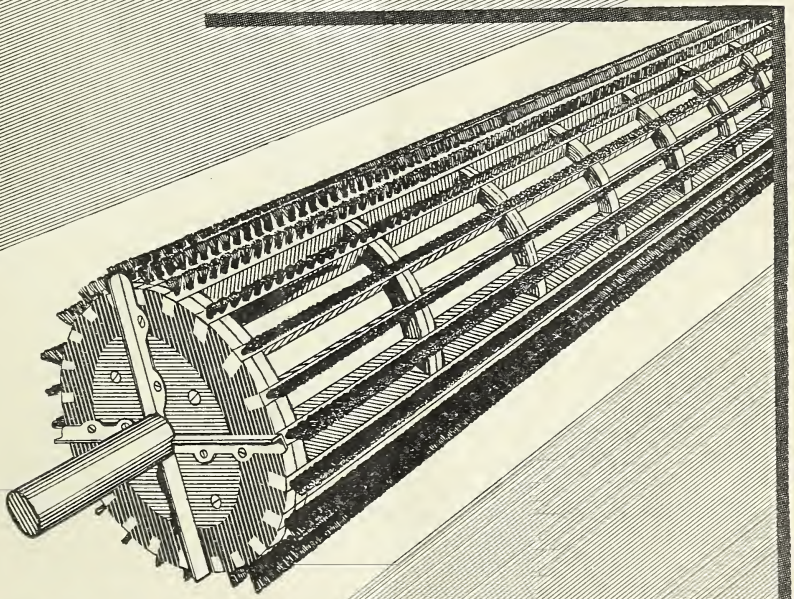
CARE AND REPAIR OF COTTON-GIN BRUSHES



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CARE AND REPAIR OF COTTON-GIN BRUSHES[1]

By Victor L. Stedronsky, *assistant mechanical engineer, Bureau of Agricultural Engineering,* and Arvid J. Johnson, *junior cotton technologist, Bureau of Agricultural Economics* [2]

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INTRODUCTION

The commercial saw cotton gins in the United States are of two principal types; one employs a brush and the other an air blast for doffing the lint from the saws and providing air for conveying the lint to the condenser and press. Brush gins predominate in the Southeastern and Central States, but there are more air-blast than brush gins in the Western States.[3] In 1935 brush gins were used in 72 percent of the ginneries in the Southeastern States, in 70 percent in the Central States, and in 47 percent in the Western States.[4]

Observations at commercial gins during the last 10 years indicate that quality and efficiency of ginning are lowered by using badly worn or saw-cut brushes. An inspection in 1929 and 1930 of 400 more-or-less representative commercial ginneries having brush gins revealed that those with brushes in only fair to poor condition made up 40 percent of the total inspected in the Southeastern States, 25 percent in the Central States, and 20 percent in the Western States. The percentage of worn brushes was greater in the Southeastern States than in either of the other regions because the gins in this area were much older, had smaller volumes of business and less income, and had less cleaning equipment for protecting the brushes against wear from foreign matter.

From these figures and the number of bales ginned on brush gins in the different areas during the 1930 season, it appears that about 1½ million bales were ginned that season with gin brushes in only fair to

[1] The cotton-quality phases of this report are a part of the program of work of the Cotton Utility and Standards Research Section under the leadership of R. W. Webb, principal cotton technologist, Bureau of Agricultural Economics.

[2] Credit is due Charles A. Bennett, senior mechanical engineer, Bureau of Agricultural Engineering, and Francis L. Gerdes, cotton technologist, Bureau of Agricultural Economics, for supervision and helpful suggestions. Hughes Butterworth, associate specialist in cotton classing, Bureau of Agricultural Economics, made the cotton classifications, and that Bureau collected the data on gin-brush conditions of commercial gins.

[3] The southeastern group comprises Alabama, Florida, Georgia, North Carolina, South Carolina, and Virginia; the central group comprises Arkansas, Louisiana, Mississippi, Missouri, and Tennessee; the western group comprises Arizona, California, New Mexico, Oklahoma, and Texas.

[4] These figures are based on the following reports: United States Bureau of the Census, cotton ginning machinery and equipment, 1935, by states.

poor condition.[5] Limited observations during the last few years indicate the situation has not improved much. It is, therefore, the purpose of this circular to stress the importance of maintenance, repair, and setting of gin brushes in insuring efficient doffing of lint from the saws and in minimizing losses in ginning time and value of the product by indicating, (1) the results of experimental work on the subject, and (2) the proper care and maintenance of brushes.

IMPORTANCE OF KEEPING GIN BRUSHES IN GOOD CONDITION

Injury to gin brushes may result from poor material used in their construction, from improper operating settings and speeds, from foreign matter encountered during ginning, or from improper care during the ginning season or when idle. Without special care in operation and without timely repairs, brushes are subjected to excessive wear and tear. Because of the large number of brush gins, aggregate losses from poor brushes may be very high.

To illustrate the effects of permitting gin brushes to become badly worn, results obtained from comparative ginning tests with a good brush and a poor one at the United States Cotton Ginning Laboratories in 1936 are summarized in the following paragraphs. The brush cylinders used in the tests are shown in figure 1. The bristles of the poor-condition brush are worn and saw-cut. The tests were made on a 70-saw gin with the conventional form of brush. The results are not applicable to any of the patented brushes in which metal strips are used to produce a fan-doffing action.

A sufficient number of upland varieties of cotton of different staple lengths, moisture contents, and other physical properties, grown in Arkansas, Georgia, Louisiana, Mississippi, Tennessee, and Texas, and described in table 1, were used to provide reliable results.

Of each cotton tested one lot was ginned with a loose seed roll and the good brush; another lot was ginned on the same gin stand with the poor brush, maintaining as nearly as possible the same seed-roll density as with the good brush; and a third lot was ginned using the brush of poor condition and maintaining a rate of feeding of the cotton to the gin as nearly as practicable the same as that used in ginning with the good brush. With the first two lots, the rate of feeding the cotton to the gin stand was not necessarily the same because the roll density was held constant by adjusting the feeding rate to keep the same height and "feel" of the roll. The purpose with the third lot was to determine whether the roll density would increase when the poor brush was used, and the effects of any such increased roll tightness on lint quality and on other factors of ginning.

During each test, samples to be classed and reviewed by Government classers were taken at the condenser, and records of lint turnout, ginning time, power requirements, and other observations were made. The data were analyzed statistically, and their significance was determined to provide a sound basis for the conclusions derived from the tests.[6] The more pertinent results are presented in table 2 as averages for five long-staple moist cottons, eight long-staple dry

[5] Estimate based on the assumption that brush gins handle about the same quantity of cotton per ginnery as air-blast gins.

[6] For a detailed discussion of the laboratory and statistical methods see the following publication: Gerdes, F. L., and Bennett, C. A. EFFECT OF ARTIFICIALLY DRYING SEED COTTON BEFORE GINNING ON CERTAIN QUALITY ELEMENTS OF THE LINT AND SEED AND ON THE OPERATION OF THE GIN STAND. U. S. Dept. Agr. Tech. Bull. 508, 62 pp., illus. 1936.

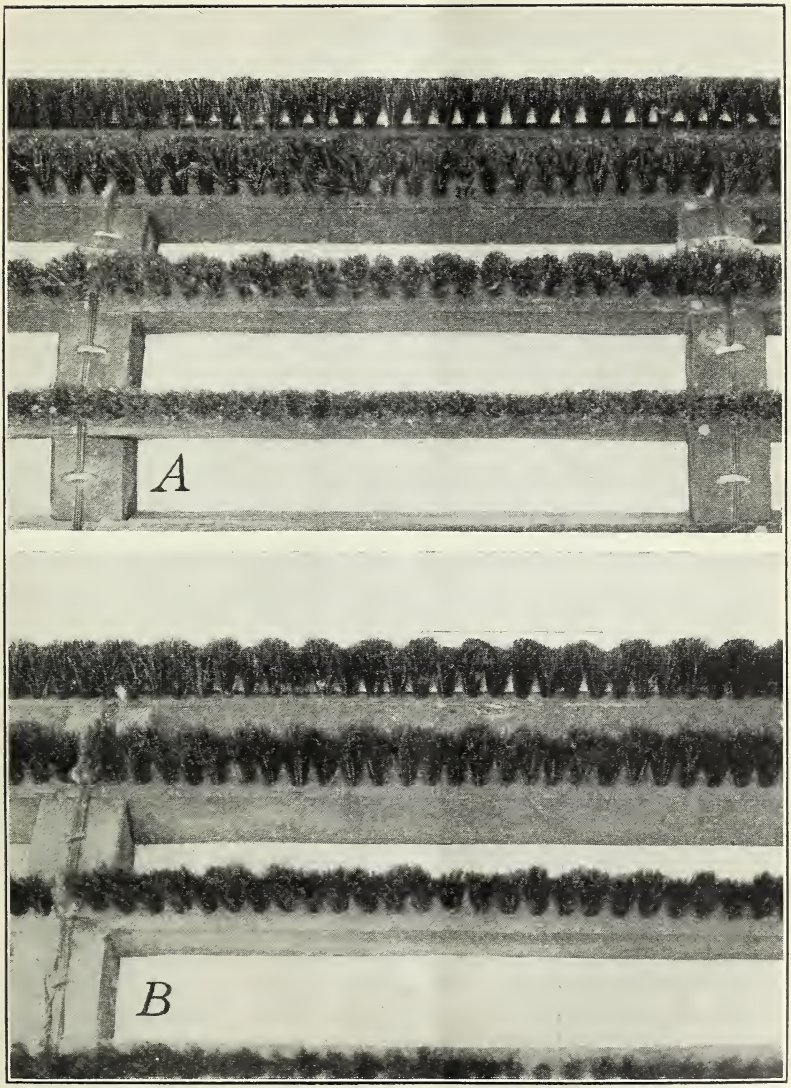

FIGURE 1.—Gin-brush cylinders: *A*, In good condition; *B*, worn and saw-cut. The line above the brushes shows location of tips when brushes were new.

TABLE 1.—*Cottons used in gin-brush condition tests*

Staple-length group (inches)	Moisture-content group	Lot No.	Variety	Place of growth	Harvesting date	Moisture content of seed cotton [1]	Foreign matter content of seed cotton [2]	Cotton classer's appraisals [3]	
								Staple length	Grade [4]
	Percent					*Percent*	*Percent*	*Inches*	
1⅛ and longer	12 and above	601	Stoneville 2B	Stoneville, Miss.	Aug. 11–12	15.2	0.8	1 5/32	S. M., B.
		602	Delfos 531	Dunleith, Miss.	Aug. 12	12.1	.7	1 1/8	S. M., B.
		603	Delfos 9252	Stoneville, Miss.	do	12.7	.9	1 1/4	S. M., B.
		605	Stoneville 2A	Burdette, Miss.	Aug. 13	12.1	.7	1 5/32	S. M., B.
		650	Missdel 7	Stoneville, Miss.	Sept. 14	13.5	1.0	1 3/16	M., B.
	Below 12	608	D. P. L. 11	Greenville, Miss.	Aug. 11–12	8.0	.4	1 1/8	G. M., B.
		610	Missdel 3–1411	Stoneville, Miss.	Aug. 19	8.9	1.6	1 3/16	M., B.
		611	do	do	Aug. 20	10.7	.9	1 3/16	S. M., B.
		620	Missdel 6	do	do	8.4	1.4	1 1/8	M., B.
		623	do	do	Aug. 27	11.0	1.5	1 1/8	M., B.
		627	Delfos 9252	Greenville, Miss.	Aug. 20–21	7.6	1.3	1 1/8	M., B.
		634	Missdel 3	do	Aug. 31	8.1	1.5	1 3/16	S. M., B.
		637	Delfos 9252	do	Sept. 2–3	6.7	1.0	1 3/16	S. M., B.
Shorter than 1⅛	12 and above	607	Rhyne's Cook	Tifton, Ga.	Aug. 3–12	13.6	2.7	7/8	S. M. sp.
		615	Dixie Triumph	Baton Rouge, La.	Aug. 19	12.4	1.1	1 1/32	M.
		638	do	do	do	12.0	2.4	29/32	S. L. M. sp.
		642	Rowden 40	Montrose, Ark.	Sept. 8	15.6	2.0	1 1/32	S. M. sp.
		643	Wilson Big Boll	Wilson, Ark.	do	16.1	3.9	1 1/32	S. M. sp.
		655	D. P. L. 11	Ridgely, Tenn.	Sept. 14–15	13.7	2.1	1 3/32	M.
	Below 12	606	Bennett	Edroy, Tex.	Aug. 10	8.2	3.5	1	M.
		614	Lone Star	Greenville, Tex.	Aug. 17–19	6.7	1.1	15/16	S. M.
		625	Rowden 40	Montrose, Ark.	Aug. 27	9.0	.6	1 1/32	S. M.
		628	Half and Half	Edroy, Tex.	Aug. 20	7.5	3.9	15/16	S. L. M.
		633	Missdel 1–0539	Stoneville, Miss.	Sept. 1	10.6	1.2	1 3/32	M.
		636	Stoneville 2B	do	Sept. 1–3	6.6	1.1	1 3/32	S. M.
		666	Dixie Triumph	Baton Rouge, La.	Sept. 12	10.4	2.8	1	L. M.

[1] As determined by oven tests.
[2] As determined by fractionation tests.
[3] Lint samples ginned with a good brush and a loose seed roll at the manufacturer's recommended speed.
[4] Abbreviations: G. M.=Good middling; S. M.=Strict middling; B.=Preparation designation; M.=Middling; S. L. M.=Strict low middling; sp.=Spotted; L. M.=Low middling.

cottons, six short-staple moist cottons, and seven short-staple dry cottons.

TABLE 2.—*Average effect of gin-brush condition on the ginning time and on the bale weight and value*

Seed cotton [1]		Condition of gin brush	Seed-roll density	Ginning time [2]	Weight of bale [3]	Value of bale [4]
Staple length group	Moisture content group					
				Minutes	*Pounds*	*Dollars*
Inches	*Percent*	Good	Loose	48	470	62.75
1⅛ and longer	12 and above	Worn	do	53	467	62.08
		do	Loose to medium [5]	46	465	61.11
	Below 12	Good	Loose	52	452	57.83
		Worn	do	55	450	57.62
		do	Loose to medium [5]	51	451	57.24
Shorter than 1⅛	12 and above	Good	Loose	45	477	51.70
		Worn	do	48	477	51.56
		do	Loose to medium [5]	44	474	50.89
	Below 12	Good	Loose	54	498	55.07
		Worn	do	57	499	55.21
		do	Loose to medium [5]	53	498	55.09

[1] See table 1 for identification and description of the cottons used in these tests and for the ranges covered by them.

[2] For ginning 1,500 pounds of seed cotton.

[3] Calculated by applying the turn-out percentage of lint to 1,500 pounds of seed cotton and adding 22 pounds for bagging and ties.

[4] Calculated by multiplying bale weight by the price of the grade and staple produced in the tests. Prices used were based on approximate average prices per pound for cotton of specified white grades and staple lengths prevailing at Memphis, Tenn., for the seasons 1932–33, 1933–34, 1934–35, and 1935–36.

[5] Same rate of feeding as the loose roll with the good brush. Worn condition of brush caused seed roll gradually to increase in density with this feeding rate.

When seed cotton was fed to the gin equipped with the poor brush at a rate equal to that used to maintain a loose seed roll with the good brush ginning, the roll gradually became denser because the poor brush was not so effective in doffing the lint, particularly with the damp cottons, and some of it was carried back into the roll box. Thus, when good brush-ginning capacity is obtained with poor brush operation, injury to the cotton is likely, because some of the lint is carried on the saws back into the roll box, thereby making the saws inactive so far as removing lint from the seed is concerned, and causing the seed roll to become more dense.[7] A satisfactory control of the feeding rate in these instances is indicated by the ginning-time figures which are very near those obtained with the good-condition brush.

Good condition of gin brush was found to increase ginning capacity with a given seed-roll density (table 2). The difference in actual ginning time in favor of the good brush set-up was greatest for the group combining the longer staple and higher moisture-content cottons, and was about alike for the other three groups, when a loose seed roll was maintained. The percentage differences in capacity amounted to 10 and 7 percent, respectively, for the long- and the short-staple cottons ginned in damp condition, and to 6 and 5 percent, respectively, for the long and the short staple cottons ginned in dry condition.

With the loose seed-roll ginnings, the value of the baled lint was generally lower for the poor than for the good brush. The reduction

[7] Bennett, C. A., and Gerdes, F. L. EFFECTS OF GIN-SAW SPEED AND SEED-ROLL DENSITY ON QUALITY OF COTTON LINT AND OPERATION OF GIN STANDS. U. S. Dept. Agr. Tech. Bull. 503, 40 pp., illus. 1936.

in value caused by using the poor brush increased with increase in moisture content and in staple length of the cotton, amounting to as much as 67 cents per bale with the cottons of higher moisture content

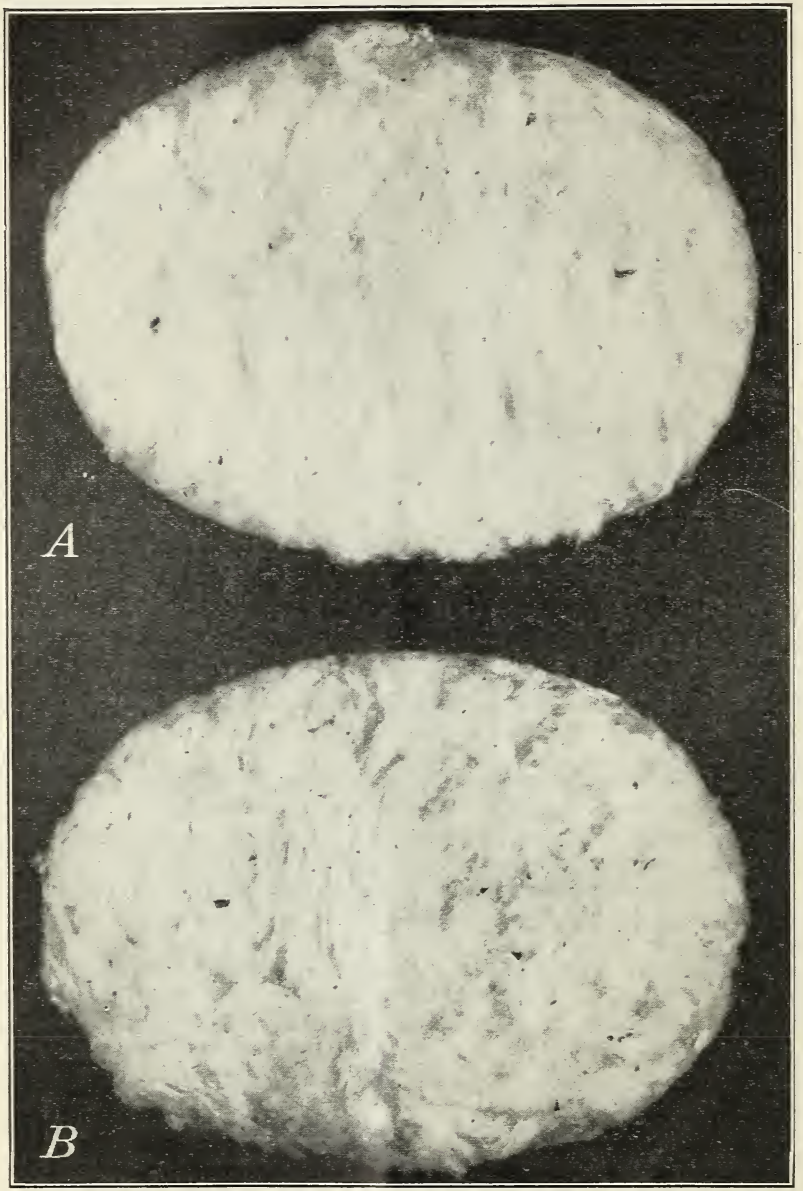

FIGURE 2.—Samples of lint ginned from a damp seed cotton of 1 3/16 inches staple length: *A*, With brush in good condition and a feeding rate of cotton to the gin stand to give a loose seed roll; *B*, with brush in poor condition and feeding rate the same as *A*.

and longer staple. These differences in value were due principally to loss in bale weight. The poor brush removed less lint from the gin saw than the good brush, and the lint left on the saw teeth was taken

back into the roll box because the brush was not so effective in removing the lint from the saws. This caused some of the seed to be shed before they were thoroughly ginned. The poor brush was about as effective as the good brush in doffing and maintaining maximum lint turn-out with dry, short-staple cottons, because the fibers appeared to cling very lightly to the gin-saw teeth.

When an effort was made to obtain the same ginning capacity with the poor brush as with the good brush, the seed roll became tighter, especially with the moister and longer cottons. The tighter seed roll produced further damage to grade and loss in lint turn-out, which together caused losses amounting, with the damp cottons, to about $1.50 per bale for the longer and 80 cents per bale for the shorter staple groups. With the cottons of lower moisture content, loss in value occurred only with the long-staple group and amounted to about 60 cents per bale.

Some of the quality damage resulting from use of the poor-condition brush is illustrated in figure 2.

GIN-BRUSH SPEEDS AND SETTINGS

The gin brush performs two distinct functions, one of which is doffing the lint from the saw teeth, and the other is creating a blast of air to blow the lint to the condenser. It draws the air from the bottom of the gin stand, and not from the ends of the brush, whose wings prevent accumulation of the lint on the shaft of the brush. A gin-brush cylinder of the 80-saw size must move approximately 1,000 cubic feet of air per minute and should maintain a static pressure in the lint flue not greater than one-half inch of water in the indicator.

Experience has definitely shown that a gin brush should revolve at such a rate that every tooth of the saw is swept clean before it reenters the roll box. A brush-tip speed of approximately 6,666 feet per minute has been adopted by manufacturers as an optimum standard for gins equipped with 12-inch saws operating at 400 to 600 revolutions per minute. From the diameter of the brush cylinder and revolutions per minute the tip speed of the brushes in feet per minute can be calculated by the formula:

$$\text{Tip speed} = \frac{\text{revolutions per minute} \times \text{diameter in inches} \times 3.1416}{12}$$

Thus the speeds of 14-, 16-, and 18-inch diameter brush cylinders should be 1,820, 1,600, and 1,420 revolutions per minute, respectively. The customary setting of saw and brush cylinders in the factory makes the brush bristles overlap the saw teeth by no more than the full depth of the teeth, or approximately one-eighth inch. Greater overlapping may prove destructive to the bristles.

At the United States Cotton Ginning Laboratory, tests have been made to determine the effect caused by varying the brush speed from 400 revolutions per minute above to 400 revolutions per minute below the manufacturer's recommendation. Also, tests were made to determine the effect of different laps of the brush on the gin saws. Tests were made with a full-tooth lap, half-tooth lap, and with tooth point and brush tip just touching as the gin operated. The tests show that the brush speed adopted by the manufacturers was satis-

factory and that the best results were obtained when the brushes were set with a full-tooth lap on the saws (fig. 3). Observation with the stroboscope showed that the bristles of the brushes stand out when the gin is operating the same as they do when the gin is stationary.

GIN-BRUSH CONSTRUCTION

Thorough knowledge of the construction of brushes enables ginners to make repairs economically. Good construction is required as the brushes are operated at high speeds. Brush cylinders vary in size, depending on the design of the gin stand. They are usually 14 to 18 inches in diameter, the number of brush sticks per cylinder ranging from 22 to 28. The free length of bristle beyond the sticks is 1 inch.

Various patented types of brush-cylinder construction are on the market, some of which have excellent features. In general the manufacturers employ conventional construction developed by years of experience and upon which the patents have expired. Gin-brush construction requires a continuous steel shaft about $2\frac{3}{16}$ inches in diameter of sufficient length to extend through the brush and to accommodate the bearings, pulleys, etc. Wooden disks are equally

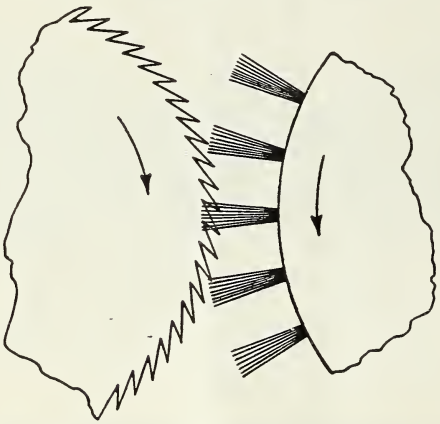

FIGURE 3.—Standard factory setting gives full overlapping of gin-brush bristles with gin-saw teeth.

spaced on this shaft and held in place with wooden wedges which are glued to the shaft and to the disks as shown in figure 4. The end disks are of double thickness and are fastened by screws to steel disks keyed to the shaft. The wooden disks are then turned to accurate size in a lathe, and shoulders are cut in which to set the sheet-metal sleeves. The slots for holding the brush sticks are cut in the disks by machine, and the sleeves are fastened to the shoulders by nails or screws.

When these operations have been completed, the cylinder is ready for the brush sticks, which are nailed securely in the slots. Wires are wound around the circumference at each disk and fastened with staples to make the sticks more secure and to strengthen the assembly. The cylinder is then placed in the trimming machine, where the bristles are trimmed evenly.

The completed brush must be accurately balanced before using. The balancing of a brush is important because of the hazard in normal high-speed operation. An unbalanced brush causes excessive vibration which makes the gin stand noisy, causes undue wear on the bearings, and may eventually cause a weak brush to fly to pieces. Babbitted bearings on brush cylinders in some of the old gins should be replaced in order to eliminate friction, thrust collars, and deterioration from gritty dust frequently present in gins. Antifriction bearings should be used instead since they maintain the balance and prolong the life of the cylinder and reduce the costs of maintenance and operation.

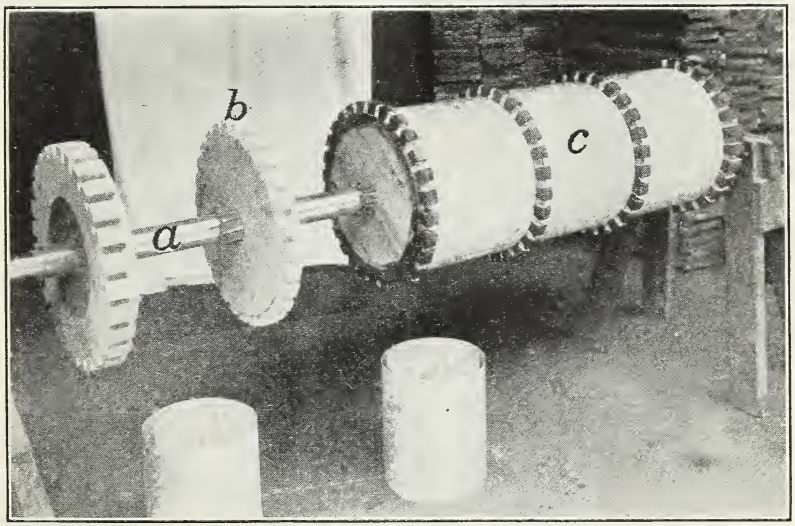

FIGURE 4.—Gin-brush under construction: *a*, Shaft; *b*, wooden disk; *c*, sheet-metal sleeve.

In the factories, new brushes are balanced dynamically so they will run as fast as 2,000 revolutions per minute without vibration. Both brush and saw cylinders of new gin stands are now fitted with ball bearings.

GIN-BRUSH REPAIRING

The brush cylinder should be removed periodically and inspected to determine what repairs are necessary. It is of utmost importance that the bristles be in good condition. If they are badly worn or saw-cut, the brush sticks should be replaced. If the brushes are in extremely bad condition, it may be well to return the cylinder to the factory for a complete overhauling, or send it to a good shop for reconditioning and balancing. If only minor repairs are necessary, such as replacing a few individual tufts or a few sticks, the ginner can generally make them. New sticks are obtainable from gin manufacturers or supply houses, and can be replaced easily, as shown in figure 5. Sticks vary in type and size, for different makes of gins, but most of them are now approximately $\frac{5}{8}$ by 1 inch in cross section. The length depends on the number of saws and make of gin stand.

Tufts of worn bristles can be removed with pliers. In replacing, a tuft is laid across the stick so that the middle of the tuft is directly over the hole. A small staple is looped over it and driven into the hole.

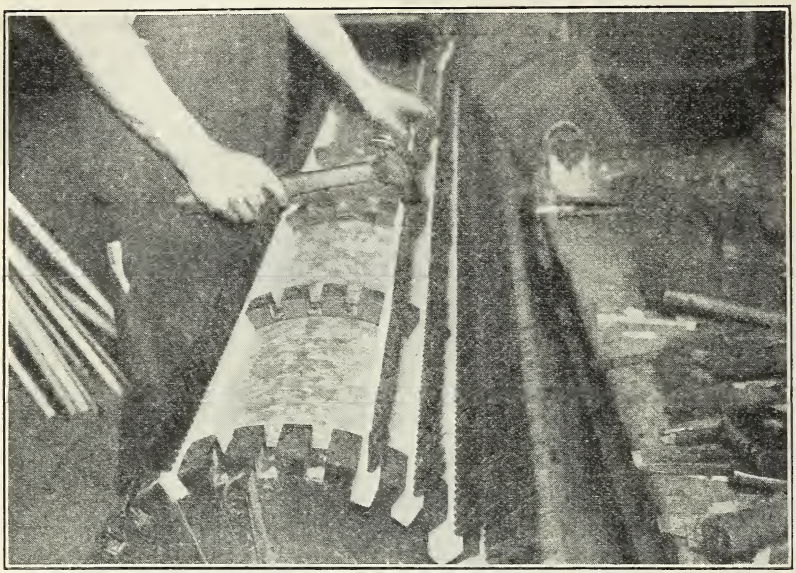

FIGURE 5.—New brush sticks being put into gin-brush cylinder.

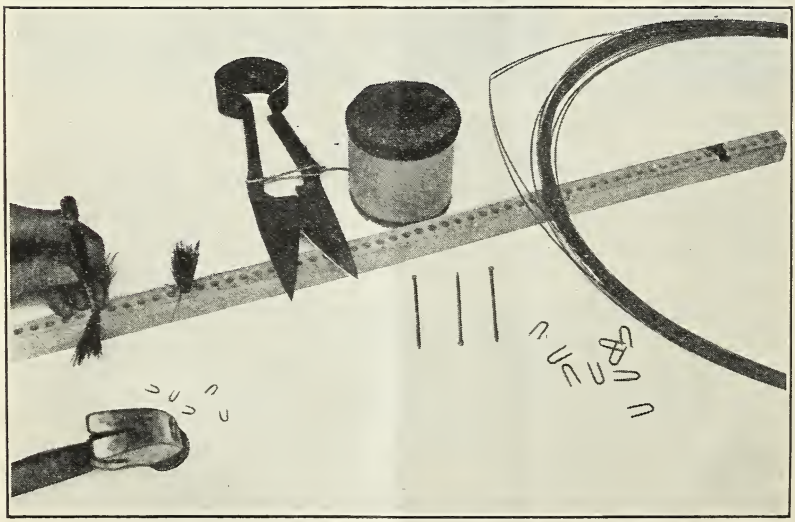

FIGURE 6.—Materials and tools used in repairing gin-brush sticks.

A nail set can be used to drive it home, as shown in figure 6. The number of bristles in the tuft depends on the size of the hole, but enough should be used so the tuft fits snugly. Usually about 300

bristles are enough. When all the worn tufts have been replaced, they must be trimmed to the length of the other tufts.

The sewed type of brush stick is repaired in a different way (fig. 7). The holes are tapered, and go entirely through the stick. The bristles are forced into the tapered hole, and kept in place with a string or wire which continues from one hole to the next. A disadvantage of this type is that if the string or wire breaks all the tufts in that stick may eventually come out. When replacing tufts in this type, the stick must be removed from the cylinder.

After the brush cylinder has been repaired, it is ready for balancing. The bearings must then be removed from the brush shaft; but to provide a better balanced assembly the drive pulley is attached to the shaft in balancing. The balancing can be done on a pair of knife edges or ball-bearing rigs, as illustrated in figure 8. The knife edges are accurately leveled. The shaft is then placed on them, making sure that they are not disturbed and that the brush turns freely. The

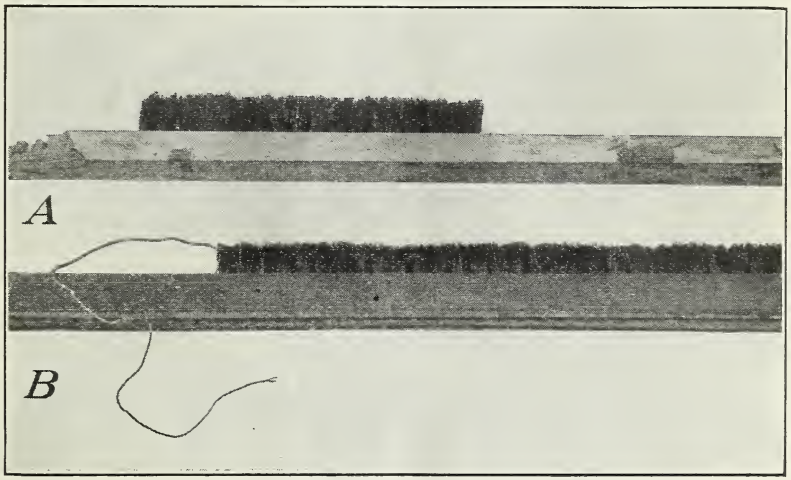

FIGURE 7.—Gin-brush sticks in which the bristles are fastened: *A*, By staples; *B*, by sewing.

cylinder is then turned gently, and allowed to rock until it finally comes to rest—the heaviest side down. For accuracy this rocking should be repeated several times. When the heaviest side is determined, a small lead weight is nailed temporarily to the opposite side (fig. 9) and the procedure is repeated, weights being added or removed until the brush when rocked does not come to rest repeatedly at the same point.

To one inexperienced in balancing a brush, this tedious procedure may appear uncalled for, but extreme care is required if the cylinders are to be properly balanced. During the balancing the knife edges should be checked frequently with a level. With ball-bearing rigs, the procedure is similar to that described for balancing with knife edges.

When the brush is finally balanced, the weights needed should be securely fastened with medium-sized nails. A convenient place for the balancing weights is between the brush sticks, on the side of the

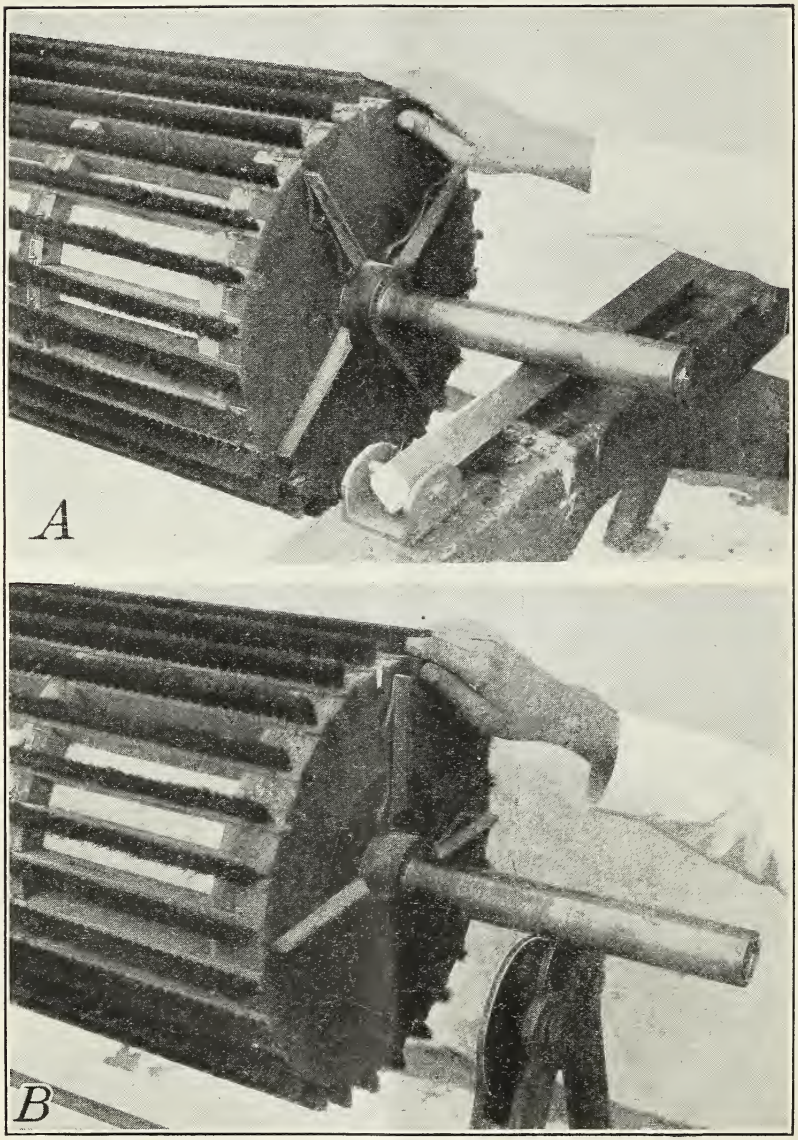

FIGURE 8.—Set-ups for balancing gin-brush cylinders: *A*, Knife edges; *B*, ball-bearing rigs.

wooden disk. Another approved method is to countersink them into the end of the cylinder. When the lead pieces are fastened permanently, they must be in exactly the same places they occupied during the balancing.

If the ginner is equipped to make minor repairs such as periodically replacing worn tufts or one or two brush sticks and balancing the cylinder, the cost usually will be small, seldom more than $5 a cylinder. On the other hand, if the cylinder is in such condition that the ginner finds it advisable to send it to a shop or the factory for complete refilling, strengthening, and balancing, the cost may be as much as $40 a cylinder. If the cylinder is in such a dilapidated condition that it will not readily function and needs to be rebuilt from the shaft out, the cost will amount to at least $70 for an 80-saw size. In this event, it might pay the ginner to buy a new cylinder, since a new 80 - saw brush equipped with drive pulley can generally be bought for $85 or $90. Ginners have found that the benefits from reconditioning gin brushes generally justify the expense. If brush bearings are kept functioning smoothly, and if brushes are balanced periodically and properly cared for, the cost of repairing will be low, probably only a few dollars a season.

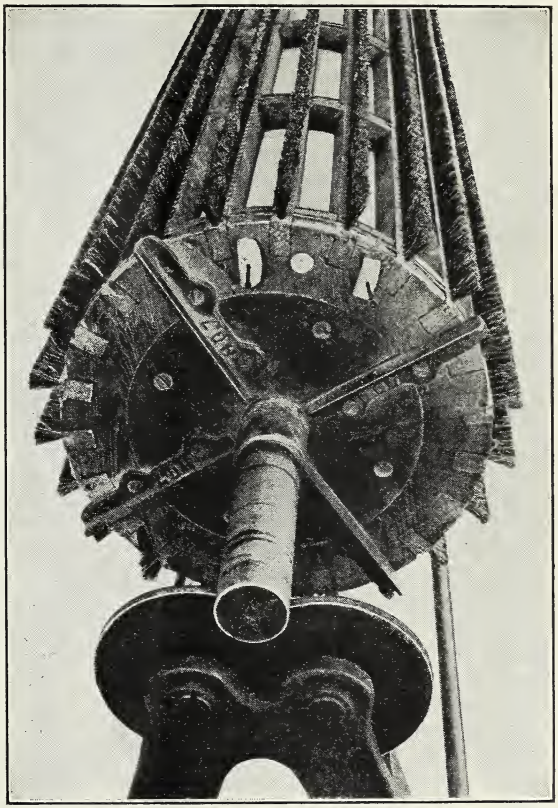

FIGURE 9.—Brush cylinder balanced with lead weights.

CARE OF BRUSHES DURING THE IDLE SEASON

At the close of the ginning season, brushes should be inspected and thoroughly cleaned, repaired if necessary, and kept dry and in good condition until the next season. Dampness tends to warp the sticks and throw the cylinder out of balance. Often damage is traceable to a leaky roof in the gin building.

Brushes should be inspected periodically through the summer to avoid rat and vermin damage. Rats find the back of a gin stand a convenient place for nests, and bristles handy material for them.

The best means for preventing this damage is to hang the brush cylinder from ceiling joists with smooth wire, or remove all covering and allow the light to enter the brush chamber.

CONCLUSIONS AND RECOMMENDATIONS

Worn-out or damaged gin brushes cause inefficient ginning and damage to the lint, and should be repaired or replaced.

Extensive ginning tests with brushes in good and in worn condition showed differences in ginning capacity with damp cotton of 10 percent for staple length of 1⅛ inches and longer and 7 percent for shorter staple length. The differences between the good and worn brushes were less with dry cottons because dry fibers are easier to remove from the saws than damp fibers. Because of loss of some of the undoffed lint with the seed and inefficient ginning, lint turn-out was lower with the poor brushes than with the good brushes.

The loss in monetary value of the lint removed with poor brushes increased with moisture content of the seed cotton and with staple length, amounting to 67 cents per bale with long-staple damp cotton ginned with seed rolls of equal density. When effort was made to maintain with the poor brush a ginning capacity equal to that with the good brush, grade damage occurred in addition to losses of lint; and with the damp cottons bale-value losses amounted to $1.50 for the longer and 80 cents for the shorter staple.

Manufacturers' recommended brush speeds should be used. A brush-tip speed of 6,666 feet per minute has been adopted as a standard for gins equipped with 12-inch saws operated at speeds between 400 and 600 revolutions per minute.

Timely repairs to gin brushes are usually profitable not only from the standpoint of the farmer, but from that of the ginner. Regular inspection and repairs of brushes will hold costs to a minimum. Reconditioning of gin brushes may be done by factory workers, transient repair men, or gin operators. After the brush cylinder is removed from the gin, the procedure usually is: Removal of worn bristles, insertion of new bristles, trimming of the bristles with shears, and finally, balancing the cylinder. Sometimes brush sticks are so badly damaged that new sticks must be provided. If the entire brush assembly is in bad condition, it may be advisable to send it to a factory or repair shop for thorough reconditioning and balancing by expert mechanics with precision tools and equipment designed to do the job efficiently and economically.

Brushes are generally balanced dynamically at factories or repair shops. At the gin they may be balanced statically with straightedges or ball-bearing rigs.

After the brush is repaired and balanced, it should be so placed in the gin stand that the bristles overlap the saws to about the depth of the teeth.

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